

## CLAIMS

1. A lithium ion secondary battery comprising:
  - a positive electrode capable of absorbing and desorbing lithium ion;
  - a negative electrode capable of absorbing and desorbing lithium ion;
  - a porous film interposed between said positive electrode and said negative electrode; and
  - a non-aqueous electrolyte;wherein said porous film is adhered to a surface of at least said negative electrode,
  - said porous film comprises an inorganic filler and a first binder, a content of said first binder in said porous film being 1.5 to 8 parts by weight per 100 parts by weight of said filler,
  - said first binder comprises a first rubber including an acrylonitrile unit, said first rubber being water-insoluble and having a decomposition temperature of 250°C or higher,
  - said negative electrode comprises a negative electrode active material capable of absorbing and desorbing lithium ion and a second binder, and
  - said second binder includes a second rubber particle and a water-soluble polymer.
2. The lithium ion secondary battery in accordance with claim 1, wherein said first rubber has a crystalline

melting point of 250 °C or more.

3. The lithium ion secondary battery in accordance with claim 1, wherein said first rubber includes a polyacrylonitrile chain.

4. The lithium ion secondary battery in accordance with claim 1, wherein said first rubber comprises core-shell type particles and has an adhesive surface portion.

5. The lithium ion secondary battery in accordance with claim 1, wherein said water-soluble polymer includes a methylcellulose unit.

6. The lithium ion secondary battery in accordance with claim 1, wherein said second rubber particle includes a styrene unit and a butadiene unit.

7. The lithium ion secondary battery in accordance with claim 1, wherein a content of said second binder in said negative electrode is 1.5 to 3 parts by weight per 100 parts by weight of said negative electrode active material.

8. The lithium ion secondary battery in accordance with claim 1, wherein said inorganic filler comprises an inorganic oxide.

9. The lithium ion secondary battery in accordance with claim 8, wherein a surface of said inorganic oxide is alkaline and has a BET specific surface area of 0.9 m<sup>2</sup>/g or more.

10. The lithium ion secondary battery in accordance with claim 1, wherein said inorganic oxide includes at least

one selected from the group consisting of alumina and titanium oxide.

11. The lithium ion secondary battery in accordance with claim 1, wherein a surface roughness of said porous film is less than a surface roughness of an electrode surface to which said porous film is adhered to.

12. The lithium ion secondary battery in accordance with claim 1, wherein said inorganic filler comprises a mixture of a large particle group and a small particle group, and an average particle size A of said large particle group and an average particle size B of said small particle group satisfy the formula (1):

$$0.05 \leq B/A \leq 0.25.$$

13. The lithium ion secondary battery in accordance with claim 1, wherein said positive electrode and said negative electrode are wound with said porous film interposed therebetween.

14. The lithium ion secondary battery in accordance with claim 1, wherein a thickness of said porous film is 0.5  $\mu\text{m}$  or more and 20  $\mu\text{m}$  or less.

15. The lithium ion secondary battery in accordance with claim 1, wherein a separator is further interposed between said positive electrode and said negative electrode.

16. The lithium ion secondary battery in accordance with claim 15, wherein a thickness of said separator is 8  $\mu\text{m}$  or more and 30  $\mu\text{m}$  or less.